X.1 APXS Catalog Schema

X.1.1 Table Organization

The Mars Pathfinder APXS tables list the ancillary information generated by the APXS/Rover command, MPF/APXS telemetry data and ground data post-processing.

Note: Where applicable, the fields are traced to the Mars Pathfinder Command Dictionary Appendix A, PF-200-7.2a, version 06/02/95, D-12500.

Below are listed the catalog tables, their primary and secondary keys, a brief description of its scope and a list of the applications that can update the table. Primary keys uniquely identify an entry in the catalog, and secondary keys are frequently used search keys.

Table	*Primary Keys*	*Secondary Keys*	*Description*	*Authoring Applications*
CMND	cmdseqnum recvernum	apid	Contains only information about what the APXS was commanded to perform and download. Some fields are duplicated in the EDR table. The fields in the CMND table contain what was commanded.	MPFPREDICT
EDR	cmdseqnum sclksrtcnt recvernum	apid	Contains information regarding a particular image file. There are some duplicate fields in the CMND table. These duplicate fields contain what was received in the telemetry.	MPFTELEMPROC

The following paragraphs discuss the meaning of the various columns with the catalog specification table.

The **Label Item** column contains the PDS and VICAR label item keyword name, where applicable, followed by the ***catalog terse name*** in italic. The catalog terse name is used for all catalog queries and reporting.

The **Description** column contains the textual description of the PDS/VICAR keyword and is followed by the ***source parameter,*** which is the command parameter name taken directly from the Mars Pathfinder Command Dictionary document, D-12500.

The **Data Type** column of the grid describes the type in which the data are expressed:

Type	Description
tiny int	1 byte unsigned integer
small int	2 byte signed integer
int	4 byte signed integer
real	4 byte floating point number
double	8 byte floating point number
numeric(x,y)	exact representation of number as entered; x = total number of digits y = number of digits to the right of the decimal
bit	1 bit
varchar(n) *abreviated as vchar(n) in the text*	an alphanumeric string of up to n characters in length; the maximum is 255
char(n)	an alphanumeric string of n characters in length
datetime	SQL data type which expresses year, month, day, hour, minute, second and fraction of seconds in a configurable order
filePath	MIPL custom Sybase data type; equivalent to vchar(255)
fileName	MIPL custom Sybase data type; equvalent to vchar(120)
fileIndex	MIPL custom Sybase data type; eqivalent to xxxx

Sybase string length does not include a character for null termination. All fields can be NULL in the Sybase database.

Finally, the **Valid Values** column lists all the possible values (e.g. numeric ranges, possible strings) for label items.

X.1.2 Access Notes/Rules

The CMND and EDR tables will only allow write access via the stored procedures. In an emergency, this rule can be waved.

For Label Items that are defined as arrays of numbers, the catalog will contain a discrete field and field name for each of the array elements. The catalog names will be listed in increasing order.

All date/time fields have the limited Sybase accuracy of ±0.003 seconds.

X.1.3 Stored Procedures

By default, there will be two stored procedures (per table), one to add and one to get one record based on the primary key.

The standard stored procedures should follow a standard rules for each table:

- The "add" procedure will store a new record at *recvernum* + 1 from any existing records with the same primary key.
- The "get" procedures will always retreive the record with the highest *recvernum*.
- The "get" procedures will always search based on an exact match of the primary key (except for *recvernum*), (i.e., no range searches and no multiple record returns), The fields of the primary key will not be returned by the stored procedure.
- The "get" procedures shall always return a “modified” field that identifies the data and time of the last time the record was updated.
- The "get" procedures shall return ‘0’ indicating a successful execution; '2' no rows returned; '3' transaction state error. A return value of an odd number indicates an error, a return value of an even number indicates an anomalous, but successful execution.
- All time fields will be passed in PDS standard notation (e.g., yyyy-mm-ddThh:mm:ss.fff).

Extensions

- none defined

Additional Stored Procedures:

- An “update” procedure to set the “refetch” field of the EDR table to ‘0’.
- A “get” procedure to obtain all the records in the EDR table that have the ‘refetch’ field set to ‘1’.

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
ACCUMULATION_COUNT	Identifies the number of start/stop temperature reading pairs found in the data.	small int	<any positive value between 0 - 20>	MPFTELEMPROC	EDR
ALPHA_SAMPLING_DURATION	Spectrum accumulation time as returned in the first two bytes of the Alpha spectrum data.	string *HH:MM:SS*	<any positive value less than or equal to 182:02:30>	MPFTELEMPROC	EDR
AMBIENT_TEMPERATURE	Temperature of the x-ray preamplifier in the sensor head of the APXS instrument for the begining and end of each accumulation cycle. There will be at most 10 pairs. Mesured in degrees centigrade. This temperature is close to the ambient Mars temperature.	real (array of 20 elements)	Between -273.6 and 122.7	MPFTELEMPROC	EDR
APPLICATION_PACKET_ID *apid*	Classifies the telemetry packet from which the image data was commanded to be obtained. This packet ID is handed to the Telemetry download. This value is based on a set of values specified in the Downlink Telemetry Documents (JPL). This acronym is APID.	tiny int	(see Mars Pathfinder Rover Telemetry Dictionary)	MPFPREDICT MPFTELEMPROC	CMND EDR
APXS_COMMUNICATION_ERROR_COUNT	APXS communication error count as returned in the APXS results as part of the spectrum data packet.	integer	<any positive 16-bit value>	MPFTELEMPROC	EDR
APXS_MECHANISM_ANGLE	APXS mechanism angle, measured in degrees. This value is the raw data value returned in the APXS Results as part of the spectrum data mutliplied by 1.28.	real	none	MPFTELEMPROC	EDR
COMMAND_DESCRIPTION *cmddesc*	Text which describes the uplinked command as found in COMMAND_NAME element.	varchar (200)	<text taken directly from the Mars Pathfinder Command Dictionary, appendix A, D-12500>	MPFPREDICT	CMND
COMMAND_NAME *cmdname*	Uplinked command name as found in the Mars Pathfinder Command Dictionary, appendix A, D-12500.	varchar (20)		MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
COMMAND_SEQUENCE_NUMBER *cmdseqnum*	Number from corresponding uplink command (zero for autonomously generated messages)	small int	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
CONTACT_SENSOR_STATE	APXS contact sensor state as returned in the APXS Results as part of the spectrum data packet. Contact sensors are located on various portions of the Rover and APXS instrument. Contact sensor bits are as follows: bit 0: right front solar panel bit 1: left front solar panel bit 2: left rear solar panel bit 3: right rear solar panel bit 4: right front bumper bit 6: left front bumper bit 8: lower APXS contact sensor bit 9: starboard (upper right) APXS contact sensor bit 10: port (upper left)APXS contact sensor bit 15: unknown, received an interrupt, no latch set	integer	<any 16-bit value>	MPFTELEMPROC	EDR
CONVERTER_CURRENT	APXS 9 volt converter current as returned in the APXS Results as part of the spectrum data packet.	integer	<any positive 8-bit value>	MPFTELEMPROC	EDR
CONVERTER_VOLTAGE	APXS 9 volt converter voltage as returned in the APXS Results as part of the spectrum data packet.	integer	<any positive 8-bit value>	MPFTELEMPROC	EDR
EXPECTED_PACKETS *expectpkts*	Total number of telemetry packets which constitute a complete image, an image without missing data.	small int	<any positive value>	MPFTELEMPROC	EDR
EXPOSURE_DURATION *exposdur*	The commanded integration time, measured in seconds.	real	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
fileindex *fileindex*	Sybase internal index.	fileIndex	N.A.	N.A.	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
filename *filename*	File specification of data file in the format "filename.version". It identifies the copy of the image.	fileName	<Rover EDR specification filename >	MPFTELEMPROC	EDR
filepath *filepath*	Directory specification of the data file via UNIX pathname, which includes a trailing slash.	filePath	<UNIX pathname format>	MPFTELEMPROC	EDR
INSTRUMENT_HOST_TEMPERATURE *insttemp*	The temperature of the Rover Sensor array when the image was acquired, measured in degrees Celsius.	real	N.A.	MPFTELEMPROC	EDR
INSTRUMENT_TEMPERATURE	Temperature of the preamplifier in the electronics box of the APXS instrument at the begining and end of each accumulation cycle. There will be at most 10 pairs. Mesured in degrees centigrade.	real (array of 20 elements)	Between -273.6 and 122.7	MPFTELEMPROC	EDR
LINEAR_ACCELEROMETER *linaccx* *linaccy*	X and Y readings for linear accelerometers on the Rover spacecraft. X indicates pitch, where positive values indicate Rover front is lower; Y indicates roll, where positive values indicating right side is lower. Values are in units of g where 1 g equals 9.8 m / sec**2. Thus, raw readings from telemetry are multiplied by 0.0009765 g.	real (array of two elements)	N.A.	MPFTELEMPROC	EDR
LINES *lines*	Total number of pixels along the vertical axis of an image.	small int	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
LINE_SAMPLES *samples*	Total number of pixels along the horizontal axis of an image.	small int	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
LOCAL_TIME *localtime*	Reference time based on the IAU standard for the Martian prime meridian. For detailed description, see the Report of the IAU / IAG / COSPAR Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 1991.	varchar (12)	hh:mm:ss.fff	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
modified *modified*	Time when predict was loaded into the catalog.	datetime	year, month, day, hour, minutes, seconds	sybase	all
PACKET_CREATION_SCLK *pktsclk*	SCLK from the primary telemetry packet header of the 1st packet of the image. Used for requesting image packets from TDS.	int	<any positive value>	MPFTELEMPROC	EDR
PRODUCT_CREATION_TIME *prodcreattime*	Defines the UTC time when a product was created.	time	yyyy-mm ddT hh:mm:ss	MPFTELEMPROC	EDR
PRODUCT_ID *prodid*	A permanent, unique identifier assigned to a data product by its producer.	varchar (45)	APX_EDR-<accumulation count> - <cmnd seq num>	MPFTELEMPROC	EDR
RECEIVED_PACKETS *recvpkts*	Total number of telemetry packets which constitute the reconstructed image.	small int	<any positive value>	MPFTELEMPROC	EDR
refetch flag *refetch*	Indicates that the image needs to be obtained from TDS to fill in previous data gaps	bit	[0, 1]	MPFTELEMPROC	EDR
REFETCH REASON *refetchrsn*	Indicates why a refetch is requested	tiny int	[0, 6]	MPFTELEMPROC	EDR
ROVER_HEADING *head_az* *head_el*	Angular measure clockwise from Lander north in BAMS (Binary Angle Measurement, where 2^16 BAMS equals one revolution).	integer	[0, 65535]		
ROVER_POSITION *pos_x* *pos_y* *pos_z*	X and Y offsets in millimeters north and east, respectively, of the Lander reference.	real (array of two elements)	N.A.		
SOFTWARE_VERSION_ID *swverid*	Identifies the version of the telemetry processing software used to generate the image data.	varchar (20)	N.A.	MPFTELEMPROC	EDR
SOURCE_PRODUCT_ID *spiceid*	Filenames of SPICE kernels used to produce image data and derived data.	varchar (40)	<standard SPICE kernel names for PCK, SPK, EK, etc.>	MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
SPACECRAFT_CLOCK_START_COUNT *sclkstrtcnt*	Lander time in seconds at which the image was acquired. Synonymous to START_TIME.	int	N.A.	MPFTELEMPROC	EDR
START_ERROR_STATE	APXS error state flags for the beginning of an APXS sampling as returned in the APXS Results as part of the spectrum data.	integer	<any positive 16-bit value>	MPFTELEMPROC	EDR
START_TIME	Date and time of the beginning of an APXS sampling or observation, expressed in UTC time.	character (array)	yyyy-mm-ddT hh:mm:ss.fff	MPFTELEMPROC	EDR
STOP_ERROR_STATE	APXS error state flags at the end of an APXS sampling as returned in the APXS Results as part of the spectrum data.	integer	<any positive 16-bit value>	MPFTELEMPROC	EDR
TARGET_NAME *targname*	Identifies a target, be it a planetary body, region or feature.	varchar (100)	<Mars or some Martian feature>	MPFPREDICT	CMND
TLM_CMD_DISCREPANCY_FLAG *tlmcmddisflg*	Indicator of mismatch(es) found between commands uplinked and telemetry.	bit	1 = TRUE, 0 = FALSE	MPFTELEMPROC	EDR

Y.1 IMP Catalog Schema

Y.1.1 Table Organization

The Mars Pathfinder IMP tables list the ancillary information generated by the IMP command, MPF/IMP telemetry data and ground data post-processing.

Note: Where applicable, the fields are traced to the Mars Pathfinder Command Dictionary Appendix A, PF-200-7.2a, version 06/02/95, D-12500.

Below are listed the catalog tables, their primary and secondary keys, a brief description of its scope and a list of the applications that can update the table. Primary keys uniquely identify an entry in the catalog, and secondary keys are frequently used search keys Secondary keys are single fields unless grouped by parenthesizes.

Table	*Primary Key*	*Secondary Keys*	*Description*	*Authoring Applications*
CMND	imageid (even only) recvernum	apid	Contains only information about what the IMP was commanded to perform and download. Some fields are duplicated in the EDR and META tables. The fields in the CMND table contain what was commanded.	MPFPREDICT
EDR	imageid imagetype sclkstrtcnt recvernum	pktsclk refetch localtime	Contains information regarding a particular image file. There are some duplicate fields in the CMND and META tables. These duplicate fields contain what was received in the telemetry.	MPFTELEMPROC MPFCAHV (subset) MPFNAV (subset)
ERROR	errornum pktsclk pktsclkfine recvernum	imageid	Contains all on-board generated error messages regarding an image id.	MPFTELEMPROC

FLIGHT	usgstrtsclk fltswtype recvernum	imageid imagetype sclkstrtcnt	Contains information regarding data used in on-board processing of image data or low frequency event data needed for proper ground processing of image data. All records are manually entered. Different data tyoes have different valid fields (similar to IMP commands).	*Manual Entry*
META	sclkstrtcnt recvernum	azimuth elevation filtnum imageid (even only)	Contains ground derived information about an observation event. The fields are common across any products dervied from this event. There are some duplicate fields in the CMND and EDR tables. These duplicate fields contain what is determined to be the proper value.	MPFTELEMPROC MPFNAV MPFCAHV

The following paragraphs discuss the meaning of the various columns with the catalog specification table.

The **Label Item** column contains the PDS and VICAR label item keyword name, where applicable, followed by the ***catalog terse name*** in italic. The catalog terse name is used for all catalog queries and reporting.

The **Description** column contains the textual description of the PDS/VICAR keyword and is followed by the ***source parameter,*** which is the command parameter name taken directly from the Mars Pathfinder Command Dictionary document, D-12500.

The **Data Type** column of the grid describes the type in which the data are expressed:

Type	Description
tiny int	1 byte unsigned integer
small int	2 byte signed integer
int	4 byte signed integer
real	4 byte floating point number
double	8 byte floating point number
numeric(x,y)	exact representation of number as entered; x = total number of digits y = number of digits to the right of the decimal
bit	1 bit
varchar(n) *abreviated as vchar(n) in the text*	an alphanumeric string of up to n characters in length; the maximum is 255
char(n)	an alphanumeric string of n characters in length
datetime	SQL data type which expresses year, month, day, hour, minute, second and fraction of seconds in a configurable order
filePath	MIPL custom Sybase data type; equivalent to vchar(255)
fileName	MIPL custom Sybase data type; equvalent to vchar(120)
fileIndex	MIPL custom Sybase data type; eqivalent to xxxx

Sybase string length does not include a character for null termination. All fields can be NULL in the Sybase database.

Finally, the **Valid Values** column lists all the possible values (e.g. numeric ranges, possible strings) for label items.

y.1.2 Access Notes/Rules

Constraint checking will only be performed on the META table.

The CMND, EDR and ERROR tables will only allow write access via the stored procedures. In an emergency, this rule can be waved.

For Label Items that are defined as arrays of numbers, the catalog will contain a discrete field and field name for each of the array elements. The catalog names will be listed in increasing order.

All date/time fields have the limited Sybase accuracy of ±0.003 seconds.

y.1.3 Stored Procedures

By default, there will be two stored procedures (per table), one to add and one to get one record based on the primary key.

The standard stored procedures should follow a standard rules for each table:

- The "add" procedure will store a new record at *recvernum* + 1 from any existing records with the same primary key.
- The "get" procedures will always retreive the record with the highest *recvernum*.
- The "get" procedures will always search based on an exact match of the primary key (except for *recvernum*), (i.e., no range searches and no multiple record returns), except for the 'ERROR' table. The fields of the primary key will not be returned by the stored procedure.
- The "get" procedures shall always return a "modified" field that identifies the data and time of the last time the record was updated.
- The "get" procedures shall return '0' indicating a successful execution; '2' no rows returned; '3' transaction state error. A return value of an odd number indicates an error, a return value of an even number indicates an anomalous, but successful execution.
- For "get" procedures where the *imageid* field of the table is defined to be even-only, the stored proceedure will subtract '1' from an odd *imageid* parameter before a catalog search is begun.
- All time fields will be passed in PDS standard notation (e.g., yyyy-mm-ddThh:mm:ss.fff).

Extensions

- The "get" procedure for META table shall search the EDR table for an entry that contains the same *imageid* and *imageidpart* but has an *imagetype* equal to "dark current". It will return a field containing TRUE if such a record exists and FALSE if it does not.

Additional Stored Procedures:

- An "update" procedure to set the "refetch" field of the EDR table to '0'.
- A "get" procedure to obtain all the records in the EDR table that have the 'refetch' field set to '1'.

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
APPLICATION_PACKET_ID *apid*	Classifies the telemetry packet from which the image data was commanded to be obtained. This packet ID is handed to the Telemetry download. This value is based on a set of values specified in the Downlink Telemetry Documents (JPL). This acronym is APID. *apid*	tiny int	(see IMP Flight Software Design Supporting Document)	MPFPREDICT MPFTELEMPROC	CMND EDR META
AUTO_EXPOSURE_DATA_CUT_NUMBER *datacutnum*	A value indicating a base for pixel values using AUTO_EXPOSURE _PIXEL_FRACTION as the percentage of pixels wanted above that value. *datact*	small int	[0, 4095]	MPFPREDICT	CMND
AUTO_EXPOSURE_PIXEL_FRACTION *pixfrc*	Fraction of pixels wanted to exceed AUTO_EXPOSURE_ DATA_CUT_NUMBER, expressed as a percentage. This field is valid only if EXPOSURE_TYPE is AUTO. *pixfrc*	real	[0, 100.0]	MPFPREDICT	CMND
AZIMUTH *az*	Azimuth of camera at which image scene was captured, measured in degrees clockwise with respect to the Y_l axis of the Mars Pathfinder Lander Coordinate Frame (L Frame). The L Frame is a right-handed, orthogonal system, where Y_l lies in the X_l / Y_l plane and is positively directed outward passing through the geometric center of the petal 2, having its origin at the top surface, and in the geometric center, of the Lander base petal (petal 4). See Mars Pathfinder AIM Phasing and Coordinate Frame Document.	real	[0, 360.0]	MPFTELEMPROC MPFNAV	META
AZMUTH_ERROR *azerr*	Error range for the determination of azimuth pointing	real	[0, 360.0]	MPFTELEMPROC MPFNAV	META

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
AZIMUTH_FOV *azfov*	The angular coverage of the imaged scene measured horizontally with respect to the image plane in spacecraft coordinates.	real	<TBD>	MPFTELEMPROC MPFNAV	META
AZIMUTH_MOTOR_CLICKS *azmtrclicks*	The commanded azimuth measured in IMP motor step position in counts from the low hard stop. *azimth* *(valid for IMP_IMAGE_AZ_EL command)*	small int	[0, 650]	MPFTELEMPROC	CMND META EDR
BAD_PIXEL_REPLACEMENT_FLAG *badpix*	Indicates whether or not bad pixel replacement processing was completed. If set TRUE, certain pixels of the image will be replaced based on a bad pixel table. *badpix*	char(1)	T, F	MPFPREDICT	CMND
CAMERA_ORIENTATION_QUATERNION *camorientx* *camorienty* *camorientz* *camorienta*	A collection of four values which describe the camera model. The four values are constructed from camera C, pointing direction A, horizontal H, and vertical V.	double (array of 4 elements)	N.A.	MPFTELEMPROC *Manual Entry*	META FLIGHT
COMMAND_DESCRIPTION *cmddesc*	Text which describes the uplinked command as found in COMMAND_NAME element.	varchar (200)	<text taken directly from the Mars Pathfinder Command Dictionary, appendix A, D-12500>	MPFPREDICT	CMND
COMMAND_NAME *cmdname*	Uplinked command name as found in the Mars Pathfinder Command Dictionary, appendix A, D-12500.	varchar (20)	IMP_IMAGE_AZ_EL, IMP_IMAGE_VECTOR, IMP_IMAGE_OBJECT, IMP_IMAGE_LCLVEC, IMP_IMAGE_LCLGRD	MPFPREDICT	CMND
DARK_CURRENT_CORRECTION_FLAG *darkcorr*	Indicates that dark current correction processing was completed and the image was adjusted by a dark current correction image. *darkcr*	char(1)	T, F	MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
DOWNLOAD_FLAG *dwnload*	Specifies which image data to download; any or all of the image data (IM), dark current strip (DS), and null pixel data (NS). *dwnlod*	varchar (10)	NONE, DS, IM, DSIM, NS, DSNS, IMNS, DSIMNS	MPFPREDICT	CMND
ELEVATION *el*	Elevation of camera at which image scene was captured, measured in degrees with respect to the X_l / Y_l plane of the Mars Pathfinder Lander Coordinate Frame (L Frame). Positive degrees are measured above the X_l / Y_l plane (negative Z_l direction). The L Frame is a right-handed orthogonal system, where the X_l / Y_l plane its origin at the geometric center, and on the top surface) of the Lander base petal (petal 4) and is parallel with the plane of the Lander base petal. Z_l is perpendicular to the Lander base petal, located in the geometric center and positively directed downward from the upright Lander to the ground. See Mars Pathfinder AIM Phasing and Coordinate Frame Document.	real	[-90.0, 90.0]	MPFTELEMPROC	META
ELEVATION_ERROR *elerr*	Error range for the determination of elevation pointing	real	[0, 90.0]	MPFTELEMPROC	META
ELEVATION_FOV *elfov*	The angular coverage of the imaged scene measured vertically with respect to the image plane in spacecraft coordinates.	real	<TBD>	MPFTELEMPROC	META
ELEVATION_MOTOR_CLICKS *elmtrclicks*	The commaned elevation measured in IMP motor step position in counts from the low hard stop. *elevtn* *(valid for IMP_IMAGE_AZ_EL command)*	small int	[0, 332]	MPFTELEMPROC	CMND META EDR
error message *errormsg*	Message text corresponding to on-board IMP processing error.	varchar (255)	N.A.	MPFTELEMRPOC	ERROR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
error number *errornum*	On-board IMP processing error received in telemetry stream.	int	N.A.	MPFTELEMRPC	ERROR
error parameter value *errorparam*	Parameter value associated with the IMP error number	varchar (24)	N.A.	MPFTELEMPROC	ERROR
EXPECTED_PACKETS *expectpkts*	Total number of telemetry packets which constitute a complete image, an image without missing data.	small int	<any positive value>	MPFTELEMPROC	EDR
EXPOSURE_COUNT *exposcnt*	Maximum number of exposures to take. Valid values are dependent on EXPOSURE_TYPE. *expcnt*	tiny int	[0, 16] *[2, 5]*	MPFPREDICT	CMND
EXPOSURE_DURATION *exposdur*	The commanded integration time for manual and auto exposure, measured in milliseconds. Integration Time in IMP Telemetry Format specification from the U. of Arizona. *inttim*	real	[0.0, 32767.5]	MPFPREDICT	CMND META EDR
EXPOSURE_TYPE *expostype*	Exposure type for the image: auto, manual, pre-timed or none. Auto exposure allows for adjusting the expose time based on a previous exposure. Manual exposure is a single exposure with a set expose time. Pre-timed exposure uses the very last expose time used, regardless of what kind of exposure it was. No exposure indicates that the command moves only the camera and doesn't take an exposure. *exptyp*	varchar (20)	AUTO, INCREMENTAL (*INCR*), MANUAL, PRETIMED (*PRETMD*), NONE	MPFPREDICT	CMND
filename *filename*	File specification of data file in the format "filename.version". It identifies the copy of the image.	fileName	<IMP EDR specification filename>	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
filepath *filepath*	Directory specification of the data file via UNIX pathname, which includes a trailing slash.	filePath	<UNIX pathname format>	MPFTELEMPROC	EDR
field index fileIdx	Sybase internal index.	fileIndex	N.A.	N.A.	EDR
FILTER_NAME *filtname*	The name of the instrument filter through which the image was acquired.	varchar (20)	TBD	MPFPREDICT	CMND META EDR
FILTER_NUMBER *filtnum*	The number of the instrument filter through which the image was acquired. *fltrnm*	tiny int	[0, 11]	MPFPREDICT	CMND META EDR
FIRST_LINE *firstln*	Indicates the line within a source image that corresponds to the first line in a sub-image. *minrow + 1* *(CMND: valid if sfrmflg is TRUE)* *(FLIGHT: valid if type is "image size")*	small int	[1, 256]	MPFPREDICT	CMND FLIGHT
FIRST_LINE_SAMPLE *firstlnsamp*	Indicates the sample within a source image that corresponds to the first sample in a sub-image. *mincol + 1* *(CMND: valid if sfrmflg is TRUE)* *(FLIGHT: valid if type is "image size")*	small int	[1, 256]	MPFPREDICT	CMND FLIGHT
FLAT_FIELD_CORRECTION_FLAG *flatfd*	Indicates whether or not flat field correction processing was completed. If set TRUE, the image has been adjusted by a flat field correction image. *flatfd*	char(1)	T, F	MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
flight software type *fltswtype*	Type of on-board processing being modified.	varchar(32)	BAD_PIXEL, DARK_CURRENT,, DEPLOYMENT, FLAT_FIELD, IMAGE_SIZE, OFFSET, OPNAV_REFERENCE, QUATERNION	*Manual Entry*	FLIGHT
FOCAL_CENTER_VECTOR *foccenx* *focceny* *foccenz*	Position of the entrance pupil point of the camera lens (focal center) measured relative to the external coordinate system.	real (array of 3 elements)	N.A.	MPFCAHV	META
frame usage *frameused*	Defines the percentage of a full frame (256 x 256) used by this image	real	[0.0, 100.0]	MPFTELEMPROC	EDR
FRAME_ID *frameid*	Provides an identification for a particular instrument measurement frame. *frmtyp*	varchar (20)	FRAME_LEFT, FRAME_RIGHT, FRAME_BOTH, FRAME_LEFT_HALF	MPFPREDICT	CMND
grid position x *gridx*	X grid position defining the IMP pointing in the Local Level Frame as commanded and as defined in the Mars Pathfinder AIM Phasing and Coordinate Frame Document, PF-300-4.0-02, D-12103. *gridx* *(valid for IMP_IMAGE_LCLGRD command)*	real	[-1.0, 1.0]	MPFPREDICT	CMND
grid position y *gridy*	Y grid position defining the IMP pointing in the Local Level Frame as commanded and as defined in the Mars Pathfinder AIM Phasing and Coordinate Frame Document, PF-300-4.0-02, D-12103. *gridy* *(valid for IMP_IMAGE_LCLGRD command)*	real	[-1.0, 1.0]	MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
grid position z *gridz*	Z grid position defining the IMP pointing in the Local Level Frame as commanded and as defined in the Mars Pathfinder AIM Phasing and Coordinate Frame Document, PF-300-4.0-02, D-12103. *gridz* *(valid for IMP_IMAGE_LCLGRD command)*	real	[-1.0, 1.0]	MPFPREDICT	CMND
HISTOGRAM_FLAG *hstgrm*	Flag for histogram creation. If set, the image's histogram is produced and only the histogram is downlinked. *hstgrm*	char(1)	T, F	MPFPREDICT	CMND
HORIZONTAL_IMAGE_PLANE_VECTOR *horimagex* *horimagey* *horimagez*	$\mathbf{H} = \mathbf{H}' + x_C\mathbf{A}$, where $\mathbf{H}'$ is a unit vector parallel to the x-axis in the camera's image plane, and x_C is the point of intersection of a perpendicular dropped from the exit pupil point of the camera lens. **H', A', V'** are mutually orthogonal.	real (array of 3 elements)	N.A.	MPFCAHV	META
IMAGE_ID *imageid*	Identifies an image by command issued. If the image ID is even and non-zero, then this is the left frame of a stereo image. If the image ID one greater than the left frame image ID (odd), then this is the right frame of a stereo image. *imgid*	int	N.A.	MPFPREDICT MPFTELEMPROC *Manual Entry* *TBD*	all
IMAGE_OBSERVATION_TYPE *imagetype*	Image data type as specified in the image packet as image information bits. *(FLIGHT: valid if type is dark current, flat field or reference)*	varchar (16)	REGULAR, DARK_CURRENT, FLAT_FIELD, HISTOGRAM, SUMMATION, DARK_STRIP, NULL_STRIP	MPFTELEMPROC *Manual Entry*	EDR FLIGHT

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
IMAGE_TIME *imagetime*	Time at which the image was acquired, recorded in UTC format (synonymous to CCSDS coarse time and SPACECRAFT_CLOCK_START_COUNT).	datetime	YYYY-MM-DDThh:mm:ss.fff	MPFTELEMPROC	META
INSTRUMENT_COMPRESSION_BLK_SIZE *instcompblksiz*	Dimension of a block for on-board compression.	integer	for Rice, (1*n) where n ranges from 4 to 24. for JPEG, (n,n)	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_BLOCKS *instcompblks*	Number of blocks used to spatially segment the image file prior to compression.	small int	<any positive value that is the image number of pixels divided by the block area>	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_MODE *instcompmode*	Specifies the commaned compression target of image quality or compression factor in conjunction with Huffman or arithmetic entropy encoding with or without LCT. Odd modes select image quality, while even modes select compression factor as a target. Modes 1,2,5,6 use Huffman encoding; modes 3,4,7,8 use arithmetic encoding. Modes 5 through 8 use LCT. *JPEG specific variable.* *cmptyp*	tiny int	[1, 8]	MPFPREDICT MPFTELEMPROC	CMND EDR
INSTRUMENT_COMPRESSION_PARAM *instcompparam*	Specifies the commanded compression rate by image quality or by compression factor, based on selected compression mode. *JPEG specific variable.* *cmpdtv*	tiny int	if compression mode is odd, [1, 99]; if compression mode is even, [2, 225].	MPFPREDICT	CMND EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
INSTRUMENT_COMPRESSION_Q_TABLE_ID *instcompqtid*	Identifies the commanded reference table used for quantization in the frequency domain for transform compression or encoding types. This name or code should be specific enough to allow the user of the data to have sufficient information to reference the quantization table used to compress the data. *JPEG specific variable* *qtable*	tiny int	[0,15]	MPFPREDICT	CMND EDR
INSTRUMENT_COMPRESSION_QUALITY *instcompqual*	If an odd IMP compression mode is used for compression, this is the desired image quality index. If an even IMP compression mode is used, this is the resultant image quality used to reach a desired compression factor. (JPEG only)	tiny int	[1, 100]	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_RATE *instcomprate*	Average number of bits needed to represent a pixel with a compressed image.	real	<any positive value>	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_RATIO *instcompratio*	Ratio in bytes of the original, uncompressed data file length to its compressed form. For example, a compression ratio of 5.00 means that on average, for every five bytes of input data, one byte of compressed data was generated.	real	<any positive value>	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_SYNC_RATE *instcompsyncrate*	RICE specific variable. Number of compressed blocks between sync counters.	small int	[1, 1024]	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
INSTRUEMENT_COMPRESSION_TYPE *instcomptype*	The commanded type of compression or encryption used for data storage. contents of this value should be the full, unabbreviated, non-acronym name of coding or compression type. Examples of encoding types include but are not limited to Integer Cosine Transform (ICT), Block Truncation Coding (BTC), Discrete Cosine Transform (DCT), Joint Photographic Experts Group (JPEG) Standard DCT. *cmptyp*	varchar (100)	"Rice Adaptive Variable-lengh Coding (RICE)" or "JPEG Discrete Cosine Transform (DCT)" *Include Hufman, Arithmetic, LCT, Pixel Averaging and/or SQRT options to JPEG.*	MPFPREDICT	CMND EDR
INSTRUMENT_DEPLOYMENT_STATE_ID *instdepstateid*	Identifies whether the IMP mast is stowed or has been deployed. Default is deployed since this is the most probably state.	varchar (12)	STOWED, DEPLOYED, UNKNOWN	*Manual Entry*	FLIGHT
INSTRUMENT_TEMPERATURE *insttempccd* *insttemphead*	The temperature of the sensor (CCD) array and camera head when the image was acquired, measured in Kelvin.	real (array of 2 elements)	<any positive value>	MPFTELEMPROC	META EDR
IVP_OBJECT *object*	Identifies which IVP object at which the camera is aimed. *object* *(valid for IMP_IMAGE_OBJECT command)*	varchar (10)	SUN, EARTH, MOON, VENUS, MARS, JUPITR, SATURN, PHOBOS., DEIMOS, SCEAR, SCSUN, SCMARS, SUNP1, SUNP2, MARSP3, MARSP4, SCEP5, SCSP6, SCSP7, SCMP8, SCMP9	MPFPREDICT	CMND
LANDER_SURFACE_QUATERNION *lndrsurfx* *lndrsurfy* *lndrsurfz* *lndrsurfa*	A collection of four values which describes the relationship between the local level (M-frame) and surfaced fix (MFX-frame) coordinate frames. *(FLIGHT: valid if type is “quaternion”)*	double (array of 4 elements)	N.A.	*Manual Entry* T.B.D	FLIGHT META

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
LINES *lines*	Total number of pixels along the vertical axis of an image. *maxrow - minrow + 1* *(CMND: valid if sfrmflg is TRUE)* *(FLIGHT: valid if type is "image size")*	small int	<any positive value>	MPFPREDICT MPFTELEMPROC *Manual Entry*	CMND EDR FLIGHT
LINE_SAMPLES *samples*	Total number of pixels along the horizontal axis of an image. *maxcol - mincol + 1* *(CMND: valid if sfrmflg is TRUE)* *(FLIGHT: valid if type is "image size")*	small int	<any positive value>	MPFPREDICT MPFTELEMPROC *Manual Entry*	CMND EDR FLIGHT
LOCAL_TIME *localtime*	Reference time based on the IAU standard for the Martian prime meridian. For detailed description, see the Report of the IAU/IAG/COSPAR Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 1991.	int	hh:mm:ss.fff (sybase will convert this string into an integer by removing the punctuation. It will fill any missing fields with zeros. e.g., 23:59:23.1 will be converted to 235923100)	MPFTELEMPROC	META EDR
MLL_MFX_OFFSET_VECTOR *mllmfxoffx* *mllmfxoffy* *mllmfxoffz*	An array of X, Y, and Z offsets in millimeters from the Mars Surface Fixed Frame (MFX Frame) to the origin of the Lander Frame (L Frame). [7] *(FLIGHT: valid if type is "offset")*	real (array of 3 elements)	N.A.	*Manual Entry* T.B.D.	FLIGHT META
MLL_MFX_OFFSET_ERROR *mllmfxerrx* *mllmfxerry* *mllmfxerrz*	An array of X, Y, and Z, measured in millimeters, defining the error range of the MLL to MFX offset determination. *(FLIGHT: valid if type is "offset")*	real (array of 3 elements)	N.A.	*Manual Entry* T.B.D.	FLIGHT META
modified *modified*	Time when predict was loaded into the catalog.	datetime	year, month, day, hour, minutes, seconds	sybase	all

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
packet_creation_sclk (coarse) *pktsclk*	SCLK from the primary telemetry packet header of the 1st packet of the image. Used for requesting image packets from TDS. Each count is a second from mm/dd/yy @ hh:mm:ss.	int	<any positive value>	MPFTELEMPROC	EDR ERROR
packet_creation_sclk (fine) *pktsclkfine*	SCLK from the primary telemetry packet header of the 1st packet of the image. Used for requesting image packets from TDS. Each count is 1/256th of a second.	tiny int	[0,255]	MPFTELEMPROC	ERROR
PIXEL_AVERAGING_HEIGHT *pixavght* *pxbhit*	Block height for pixel averaging prior to image compression.	tiny int	[1, 255] required that mod(LINES / (PIXEL_AVERAGING_HEIGHT)) = 0	MPFPREDICT	CMND EDR
PIXEL_AVERAGING_WIDTH *pixavgwdth* *pxbwth*	Block width for pixel averaging prior to image compression.	tiny int	[1, 255] required that mod(SAMPLES / (PIXEL_AVERAGING_WIDTH)) = 0	MPFPREDICT	CMND EDR
POINTING_DIRECTION_VECTOR *ptdirx* *ptdiry* *ptdirz*	A unit vector **A** in the direction in which the first (or second) camera is pointed; the direction of the symmetry axis of the camera lens as measure in the external coordinate system.	real (array of 3 elements)	<TBD>	MPFCAHV	META
PRODUCT_CREATION_TIME *prodcreattime*	Defines the UTC time when a product was created.	datetime	yyyy-mm-ddThh:mm:ss.fff	MPFTELEMPROC	EDR
PRODUCT_ID *prodid*	A permanent, unique identifier assigned to a data product by its producer.	varchar (45)	"IMP_EDR- <SCLK_start_count>- <image_observation_type> <image id>"	MPFTELEMPROC	EDR
RECEIVED_PACKETS recvdpkts	Total number of telemetry packets which constitute the reconstructed image.	small int	<any positive value>	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
record version number *recvernum*	Version number of this record. starts at X and increments by 1 for every entry that has the same values for the other primary key fields	small int	<any positive>	sybase	all
refetch flag *refetch*	Indicates that the image needs to be obtained from TDS to fill in previous data gaps	bit	[0, 1]	MPFTELEMPROC	EDR
refetch reason *refetchrsn*	Indicates why a refetch is requested	tiny int	[0, 6]	MPFTELEMPROC	EDR
RICE_OPTION_NUMBER *riceoptnum*	RICE compressor specific variable.	tiny int	between 2 and (data precision - start_option + 1)	MPFTELEMPROC	EDR
RICE_START_OPTION *ricestrtopt*	RICE compressor specific variable.	tiny int	between 0 and the data precision of pixels	MPFTELEMPROC	EDR
sequence id *seqid*	Identifies the sequence number the image was part of. This uses the convention that the first four significant digits of the image id specify the sequence number.	int	[0,5000]	MPFTELEMPROC	EDR
SHUTTER_EFFECT_CORRECTION_FLAG *shtrflg* *shtflg*	A command flag set in the IMP Flight Software Command to remove the shutter, or fixed-pattern, from the image.	char(1)	T, F	MPFPREDICT	CMND
SOFTWARE_VERSION_ID *swverid*	Identifies the version of the telemetry processing software used to generate the image data.	varchar (31)	N.A.	MPFTELEMPROC	EDR
SOURCE_PRODUCT_ID *spiceid*	Filenames of SPICE kernels used to produce image data and derived data.	varchar (40)	<standard SPICE kernel names for PCK, SPK, EK, etc.> *or Sequence ID from E-kernel*	MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
SPACECRAFT_CLOCK_START_COUNT *sclkstrtcnt*	Lander time in seconds at which the image was acquired. Image Generation Time in the IMP Telemetry Format specification from the U. of Azirona. Synonymous to IMAGE_TIME. *(FLIGHT: valid if type is dark current, flat field or reference)*	int	N.A.	MPFTELEMPROC MPFTELEMPROC *Manual Entry*	META EDR FLIGHT
SQRT_COMPRESSION_FLAG *sqrtflg*	Flag for square root compressing a 12 bit pixel down to an 8 bit pixel. *sqrflg*	char(1)	T, F	MPFPREDICT	CMND
SQRT_MAXIMUM_PIXEL *sqrtmaxpix*	Maximum pixel value in 12-bit image prior to square root compression.	small int	[0, 4095]	MPFTELEMPROC	EDR
SQRT_MINIMUM_PIXEL *sqrtminpix*	Minimum pixel value in 12-bit image prior to square root compression.	small int	[0, 4095]	MPFTELEMPROC	EDR
subrame_flag *subfrmflg*	Defines that the image is not “full-size”, the image size will be specified by the lines & samples catalog fields. *sfrmfg*	char(1)	T, F	MPFPREDICT	CMND
SUM_FLAG *sumflg*	Flag for row and column summing processing. If set, the image’s rows and columns will be summed and only these results are downlinked. *sumflg*	char(1)	T, F	MPFPREDICT	CMND
SURFACE_FIXED_CAMERA_AZIMUTH *surffixaz*	Azimuth of camera measured in the Mars Surface Fixed Frame (MFX frame). Azimuth is measured positively in degrees clockwise from the Martian north (spin axis), projected onto the local gravity horizontal plane, the Mars Surface Fixed Frame X/Z plane. This value is generally known as NORTH_AZIMUTH.	real	[0.0, 360.0]	TBD	META

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
SURFACE_FIXED_CAMERA_AZIMUTH_ERROR *surffixazerr*	Error range for the determination of azimuth pointing	real	[0, 360.0]	TBD	META
SURFACE_FIXED_CAMERA_ELEVATION *surffixel*	Elevation of camera measured in the Mars Surface Fixed Frame (MFX frame). Elevation is measured in degrees up from the Mars Surface Fixed Frame X/Y plane.	real	[-90.0, 90.0]	TBD	META
SURFACE_FIXED_CAMERA_ELEVATION_ERROR *surffixelerr*	Error range for the determination of elevation pointing	real	[0, 90.0]	TBD	META
TARGET_NAME *targname*	Identifies a target, be it a planetary body, region or feature.	varchar (100)	<Mars or some Martian feature>	MPFPREDICT	CMND
TLM_CMD_DISCREPANCY_FLAG *tlmcmddisflg*	Indicator of mismatch(es) found between commands uplinked and telemetry.	bit	1 = TRUE, 0 = FALSE	MPFTELEMPROC	EDR
usage start sclk *usgstrtsclk*	SCLK that the information in the record takes effect in on-board processing	int	N.A.	*Manual Entry*	FLIGHT
vector component x *vectorx*	X component of a unit vector defining the IMP pointing. The vector is defined in one of two coordinate system based on the IMP command: IMP Frame .....IMP_IMAGE_VECTOR M Frame .....IMP_IMAGE_LCLVEC Coordinate systems are defined in the Mars Pathfinder AIM Phasing and Coordinate Frame Document, PF-300-4.0-02, D-12103. *vectrx* *(valid for IMP_IMAGE_VECTOR or IMP_IMAGE_LCLVEC command)*	real	[-1.0, 1.0]	MPFPREDICT	CMND

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
vector component y *vectory*	Y component of a unit vector defining the IMP pointing. The vector is defined in one of two coordinate system based on the IMP command: IMP Frame .....IMP_IMAGE_VECTOR M Frame .....IMP_IMAGE_LCLVEC Coordinate systems are defined in the Mars Pathfinder AIM Phasing and Coordinate Frame Document, PF-300-4.0-02, D-12103. *vectry* *(valid for IMP_IMAGE_VECTOR or IMP_IMAGE_LCLVEC command)*	real	[-1.0, 1.0]	MPFPREDICT	CMND
vector component z *vectorz*	Z component of a unit vector defining the IMP pointing. The vector is defined in one of two coordinate system based on the IMP command: IMP Frame .....IMP_IMAGE_VECTOR M Frame .....IMP_IMAGE_LCLVEC Coordinate systems are defined in the Mars Pathfinder AIM Phasing and Coordinate Frame Document, PF-300-4.0-02, D-12103. *vectrz* *(valid for IMP_IMAGE_VECTOR or IMP_IMAGE_LCLVEC command)*	real	[-1.0, 1.0]	MPFPREDICT	CMND
VERTICAL_IMAGE_PLANE_VECTOR *vertimagex* *vertimagey* *vertimagez*	$\mathbf{V} = \mathbf{V}' + y_C\mathbf{A}$, where $\mathbf{V}'$ is a unit vector parallel to the y-axis in the camera's image plane, and y_C is the point of intersection of a perpendicular dropped from the exit pupil point of the camera lens. **H', A', V'** are mutually orthogonal.	real (array of 3 elements)	N.A.	MPFCAHV	META

Z.1 Rover Catalog Schema

Z.1.1 Table Organization

The Mars Pathfinder Rover tables list the ancillary information generated by the Rover command, MPF/Rover telemetry data and ground data post-processing.

Note: Where applicable, the fields are traced to the Mars Pathfinder Command Dictionary Appendix A, PF-200-7.2a, version 06/02/95, D-12500.

Below are listed the catalog tables, their primary and secondary keys, a brief description of its scope and a list of the applications that can update the table. Primary keys uniquely identify an entry in the catalog, and secondary keys are frequently used search keys.

Table	*Primary Keys*	*Secondary Keys*	*Description*	*Authoring Applications*
CMND	cmdseqnum recvernum	apid	Contains only information about what the Rover was commanded to perform and download. Some fields are duplicated in the EDR table. The fields in the CMND table contain what was commanded.	MPFPREDICT
EDR	cmdseqnum sclksrtcnt recvernum	apid	Contains information regarding a particular image file. There are some duplicate fields in the CMND table. These duplicate fields contain what was received in the telemetry.	MPFTELEMPROC

The following paragraphs discuss the meaning of the various columns with the catalog specification table.

The **Label Item** column contains the PDS and VICAR label item keyword name, where applicable, followed by the ***catalog terse name*** in italic. The catalog terse name is used for all catalog queries and reporting.

The **Description** column contains the textual description of the PDS/VICAR keyword and is followed by the ***source parameter,*** which is the command parameter name taken directly from the Mars Pathfinder Command Dictionary document, D-12500.

The **Data Type** column of the grid describes the type in which the data are expressed:

Type	Description
tiny int	1 byte unsigned integer
small int	2 byte signed integer
int	4 byte signed integer
real	4 byte floating point number
double	8 byte floating point number
numeric(x,y)	exact representation of number as entered; x = total number of digits y = number of digits to the right of the decimal
bit	1 bit
varchar(n) *abreviated as vchar(n) in the text*	an alphanumeric string of up to n characters in length; the maximum is 255
char(n)	an alphanumeric string of n characters in length
datetime	SQL data type which expresses year, month, day, hour, minute, second and fraction of seconds in a configurable order
filePath	MIPL custom Sybase data type; equivalent to vchar(255)
fileName	MIPL custom Sybase data type; equvalent to vchar(120)
fileIndex	MIPL custom Sybase data type; eqivalent to xxxx

Sybase string length does not include a character for null termination. All fields can be NULL in the Sybase database.

Finally, the **Valid Values** column lists all the possible values (e.g. numeric ranges, possible strings) for label items.

Z.1.2 Access Notes/Rules

The CMND and EDR tables will only allow write access via the stored procedures. In an emergency, this rule can be waved.

For Label Items that are defined as arrays of numbers, the catalog will contain a discrete field and field name for each of the array elements. The catalog names will be listed in increasing order.

All date/time fields have the limited sybase accuracy of ±0.003 seconds.

Z.1.3 Stored Procedures

By default, there will be two stored procedures (per table), one to add and one to get one record based on the primary key.

The standard stored procedures should follow a standard rules for each table:

- The "add" procedure will store a new record at *recvernum* + 1 from any existing records with the same primary key.
- The "get" procedures will always retreive the record with the highest *recvernum*.
- The "get" procedures will always search based on an exact match of the primary key (except for *recvernum*), (i.e., no range searches and no multiple record returns), The fields of the primary key will not be returned by the stored procedure.
- The "get" procedures shall always return a “modified” field that identifies the data and time of the last time the record was updated.
- The "get" procedures shall return ‘0’ indicating a successful execution; '2' no rows returned; '3' transaction state error. A return value of an odd number indicates an error, a return value of an even number indicates an anomalous, but successful execution.
- All time fields will be passed in PDS standard notation (e.g., yyyy-mm-ddThh:mm:ss.fff).

Extensions

- none defined

Additional Stored Procedures:

- An “update” procedure to set the “refetch” field of the EDR table to ‘0’.
- A “get” procedure to obtain all the records in the EDR table that have the ‘refetch’ field set to ‘1’.

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
APPLICATION_PACKET_ID *apid*	Classifies the telemetry packet from which the image data was commanded to be obtained. This packet ID is handed to the Telemetry download. This value is based on a set of values specified in the Downlink Telemetry Documents (JPL). This acronym is APID.	tiny int	(see Mars Pathfinder Rover Telemetry Dictionary)	MPFPREDICT MPFTELEMPROC	CMND EDR
AZIMUTH_FOV *azfov*	The angular coverage of the imaged scene measured horizontally with respect to the image plane in spacecraft coordinates.	real	<TBD>	MPFTELEMPROC MPFNAV	EDR
COMMAND_DESCRIPTION *cmddesc*	Text which describes the uplinked command as found in COMMAND_NAME element.	varchar (200)	<text taken directly from the Mars Pathfinder Command Dictionary, appendix A, D-12500>	MPFPREDICT	CMND
COMMAND_NAME *cmdname*	Uplinked command name as found in the Mars Pathfinder Command Dictionary, appendix A, D-12500.	varchar (20)		MPFPREDICT	CMND
COMMAND_SEQUENCE_NUMBER *cmdseqnum*	Number from corresponding uplink command (zero for autonomously generated messages)	small int	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
ELEVATION_FOV elfov	The angular coverage of the imaged scene measured vertically with respect to the image plane in spacecraft coordinates.	real	<TBD>	MPFTELEMPROC	EDR
EXPECTED_PACKETS *expectpkts*	Total number of telemetry packets which constitute a complete image, an image without missing data.	small int	<any positive value>	MPFTELEMPROC	EDR
EXPOSURE_DURATION *exposdur*	The commanded integration time for manual and auto exposure, measured in milliseconds.	real	[0.5, 32767.5]	MPFPREDICT MPFTELEMPROC	CMND EDR
filename *filename*	File specification of data file in the format "filename.version". It identifies the copy of the image.	fileName	<Rover EDR specification filename >	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
filepath *filepath*	Directory specification of the data file via UNIX pathname, which includes a trailing slash.	filePath	<UNIX pathname format>	MPFTELEMPROC	EDR
fileindex *fileidx*	Sybase internal index.	fileIndex	N.A.	N.A.	EDR
FIRST_LINE *firstln*	Indicates the line within a source image that corresponds to the first line in a sub-image.	tiny int	[1,256]	MPFPREDICT MPFTELEMPROC	CMND EDR
FIRST_LINE_SAMPLE *firstlnsamp*	Indicates the sample within a source image that corresponds to the first sample in a sub-image.	tiny int	[1,256]	MPFPREDICT MPFTELEMPROC	CMND EDR
FOCAL_CENTER_VECTOR *foccenx* *focceny* *foccenz*	Position of the entrance pupil point of the camera lens (focal center) measured relative to the external coordinate system. Corresponds to the C vector in the CAHV camera model.	real (array of 3 elements)	N.A.	MPFCAHV	EDR
FRAME_ID *frameid*	Provides an identification for a particular instrument measurement frame.	varchar (20)	LEFT RIGHT, READ	MPFPREDICT MPFTELEMPROC	CMND EDR
HORIZONTAL_IMAGE_PLANE_VECTOR *horimagex* *horimagey* *horimagez*	$\mathbf{H} = \mathbf{H}' + x_C\mathbf{A}$, where $\mathbf{H}'$ is a unit vector parallel to the x-axis in the camera's image plane, and x_C is the point of intersection of a perpendicular dropped from the exit pupil point of the camera lens. $\mathbf{H}', \mathbf{A}', \mathbf{V}'$ are mutually orthogonal. Corresponds to the H vector in the CAHV camera model.	real (array of 3 elements)	N.A.	MPFCAHV	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
IMAGE_ID *imageid*	Unambiguously identifies an image. IMAGE_ID is a concatenation of APID code letter, and command sequence number. Each APID code maps to a APID code letter to be used in the IMAGE_ID. The following is a mapping of number to uppercase letter: 8, 'S'; 9, 'T'; 10, 'L'; 24, 'A'; 25, 'N'. 'S' represents science; 'T' represents technology; 'L' represents Lander engineering; 'A' represents autonomous; and 'N' represents operations or navigation. A sample image id is "L09329," where this image is a Lander engineering image. The command sequence number is 09329.	small int	N.A. (sybase stored procedure will convert the image_id string into a small int and vice versa. Internally, the image_id will have the APID digits preceeding the command sequence number, instead of the corresponding ASCII character)	MPFTELEMPROC	EDR
IMAGE_TIME *imagetime*	Time at which the image was acquired, recorded in UTC format (synonymous to CCSDS coarse time and SPACECRAFT_CLOCK_START_COUNT).	datetime	YYYY-MM-DDThh:mm:ss.fff	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_BLK_SIZE *instcompblksiz*	Dimension of a block for compression. This value stores in the catalog the single dimension of a block. For BTC, this value represents both the line and sample dimensions of the block.	int	BTC encoding type, 8 is valid.	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_BLOCKS *instcompblks*	Number of blocks used to spatially segment the image file prior to compression.	small int	<any positive value that is the image number of pixels divided by the block area>	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_RATE *instcomprate*	Average number of bits needed to represent a pixel with a compressed image.	real	<any positive value>	MPFTELEMPROC	EDR
INSTRUMENT_COMPRESSION_RATIO *instcompratio*	Ratio in bytes of the original, uncompressed data file length to its compressed form. For example, a compression ratio of 5.00 means that on average, for every five bytes of input data, one byte of compressed data was generated.	real	<any positive value>		EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
INSTRUMENT_COMPRESSION_TYPE *instcomptype*	The commanded type of compression or encryption used for data storage. contents of this value should be the full, unabbreviated, non-acronym name of coding or compression type. Examples of encoding types include but are not limited to Integer Cosine Transform (ICT), Block Truncation Coding (BTC), Discrete Cosine Transform (DCT), Joint Photographic Experts Group (JPEG) Standard DCT.	varchar (100)	"Block Truncation Coding (BCT)" or "Uncompressed (RAW)"	MPFPREDICT MPFTELEMPROC	CMND EDR
INSTRUMENT_TEMPERATURE *insttemp*	The temperature of the sensor (CCD) array when the image was acquired, measured in degrees Celsius.	real	N.A.	MPFTELEMPROC	EDR
LINEAR_ACCELEROMETER *linaccx* *linaccy*	X and Y readings for linear accelerometers on the Rover spacecraft. X indicates pitch, where positive values indicate Rover front is lower; Y indicates roll, where positive values indicating right side is lower. Values are in units of g where 1 g equals 9.8 m / sec**2. Thus, raw readings from telemetry are multiplied by 0.0009765 g,	real (array of two elements)	N.A.	MPFTELEMPROC	EDR
LINES *lines*	Total number of pixels along the vertical axis of an image.	small int	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
LINE_SAMPLES *samples*	Total number of pixels along the horizontal axis of an image.	small int	<any positive value>	MPFPREDICT MPFTELEMPROC	CMND EDR
LOCAL_TIME *localtime*	Reference time based on the IAU standard for the Martian prime meridian. For detailed description, see the Report of the IAU / IAG / COSPAR Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 1991.	int	hh:mm:ss.fff (sybase will convert this string into an integer by removing the punctuation. It will fill any missing fields with zeros. e.g., 23:59:23.1 will be converted to 235923100)	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
modified *modified*	Time when predict was loaded into the catalog.	datetime	year, month, day, hour, minutes, seconds	sybase	all
PACKET_CREATION_SCLK *pktsclk*	SCLK from the primary telemetry packet header of the 1st packet of the image. Used for requesting image packets from TDS.	int	<any positive value>	MPFTELEMPROC	EDR
POINTING_DIRECTION_VECTOR *ptdirx* *ptdiry* *ptdirz*	A unit vector **A** in the direction in which the first (or second) camera is pointed; the direction of the symmetry axis of the camera lens as measure in the external coordinate system. Corresponds to the A vector in the CAHV camera model.	real (array of 3 elements)	<TBD>	MPFCAHV	EDR
PRODUCT_CREATION_TIME *prodcreattime*	Defines the UTC time when a product was created.	datetime	yyyy-mm-ddT hh:mm:ss	MPFTELEMPROC	EDR
PRODUCT_ID *prodid*	A permanent, unique identifier assigned to a data product by its producer.	varchar (45)	"RVR_EDR-<image_id>-<frame id>"	MPFTELEMPROC	EDR
RECEIVED_PACKETS *recvdpkts*	Total number of telemetry packets which constitute the reconstructed image.	small int	<any positive value>	MPFTELEMPROC	EDR
refetch *refetch*	Indicates that the image needs to be obtained from TDS to fill in previous data gaps	bit	0, 1	MPFTELEMPROC	EDR
refetch reason *refetchrsn*	Indicates why a refetch is requested	tiny int	[0, 6]	MPFTELEMPROC	EDR
ROVER_HEADING *headaz* *headel*	Angular measure clockwise from Lander north in BAMS (Binary Angle Measurement, where 2^16 BAMS equals one revolution).	integer	[0,65535]	MPFTELEMPROC	EDR
ROVER_POSITION *posx* *posy* *posz*	X and Y offsets in millimeters north and east, respectively, of the Lander reference.	real (array of two elements)	N.A.	MPFTELEMPROC	EDR

Label Item	Description	Data Type	Valid Values	Authoring Application	Table
SOFTWARE_VERSION_ID *swverid*	Identifies the version of the telemetry processing software used to generate the image data.	varchar (31)	N.A.	MPFTELEMPROC	EDR
SOURCE_PRODUCT_ID *spiceid*	Filenames of SPICE kernels used to produce image data and derived data.	varchar (40)	<standard SPICE kernel names for PCK, SPK, EK, etc.>	MPFPREDICT	CMND
SPACECRAFT_CLOCK_START_COUNT *sclkstrtcnt*	Lander time in seconds at which the image was acquired. Image Generation Time in the IMP Telemetry Format specification from the U. of Azirona. Synonymous to IMAGE_TIME.	int	N.A.	MPFTELEMPROC	EDR
TARGET_NAME *targname*	Identifies a target, be it a planetary body, region or feature.	varchar (100)	<Mars or some Martian feature>	MPFPREDICT	CMND
TLM_CMD_DISCREPANCY_FLAG *tlmcmddisflg*	Indicator of mismatch(es) found between commands uplinked and telemetry.	bit	1 = TRUE, 0 = FALSE	MPFTELEMPROC	EDR
VERTICAL_IMAGE_PLANE_VECTOR *vertimagex* *vertimagey* *vertimagez*	$\mathbf{V} = \mathbf{V}' + y_C\mathbf{A}$, where $\mathbf{V}'$ is a unit vector parallel to the y-axis in the camera's image plane, and y_C is the point of intersection of a perpendicular dropped from the exit pupil point of the camera lens. **H', A', V'** are mutually orthogonal. Corresponds to the V vector in the CAHV camera model.	real (array of 3 elements)	N.A.	MPFCAHV	EDR